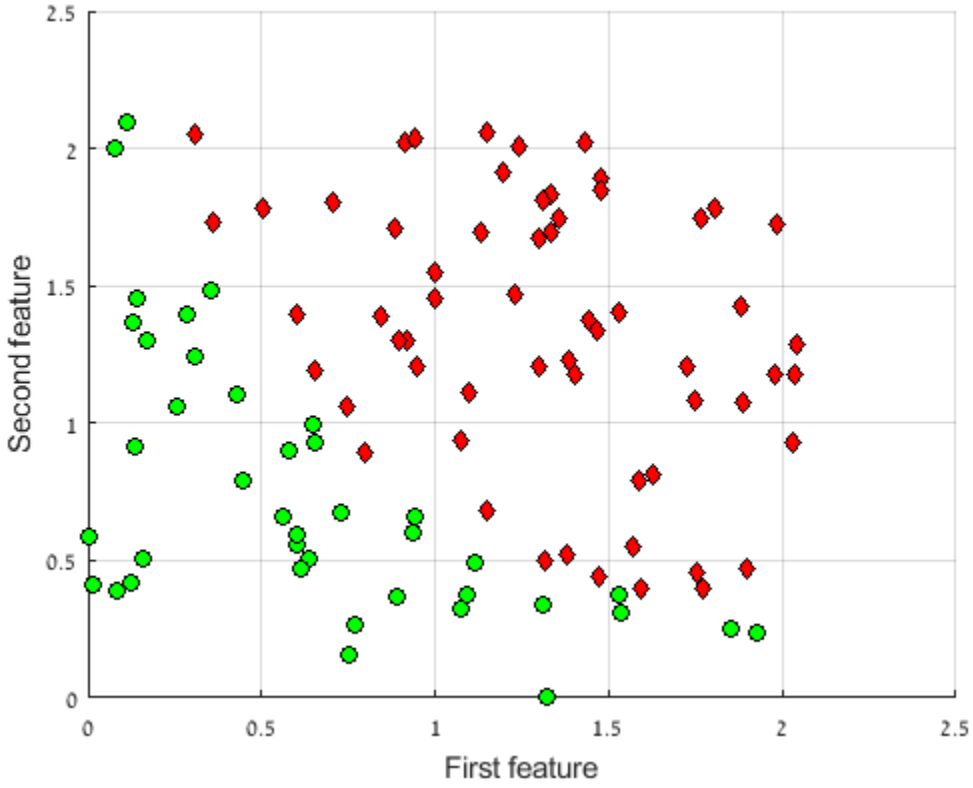
Table of Contents

Ex - 1:

```
clear;
clc;
close all;
load 'emaildata1.mat';
```

Section a

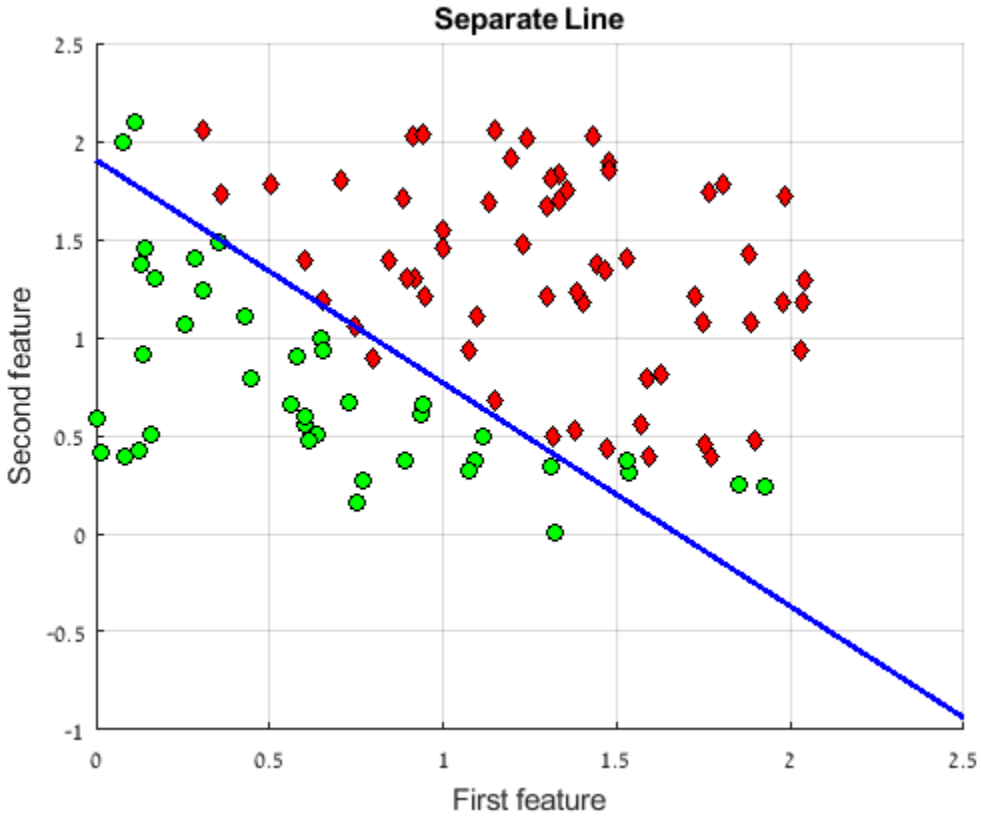
```
%plot the data, each of the y's(0,1) vals are in diffrent color
grid;hold on
plot(X(y==0,1),X(y==0,2),'ko','MarkerFaceColor', 'g'); hold on
plot(X(y==1,1),X(y==1,2),'kd','MarkerFaceColor', 'r');hold on
xlabel('First feature');ylabel('Second feature');hold on;
```



Section b

```
numOfIterations = 10000;
alpha=0.01;
X1 = [ones(length(y),1) X]; %concatinat the ones vector to X
theta=zeros(size(X1,2),1);

[theta , J]= gd(X1,y,theta,alpha,numOfIterations);
%printing linear line
plotLine(X1,y,theta);hold on; %plotLine is the function from the class
 exercise
```



Section c

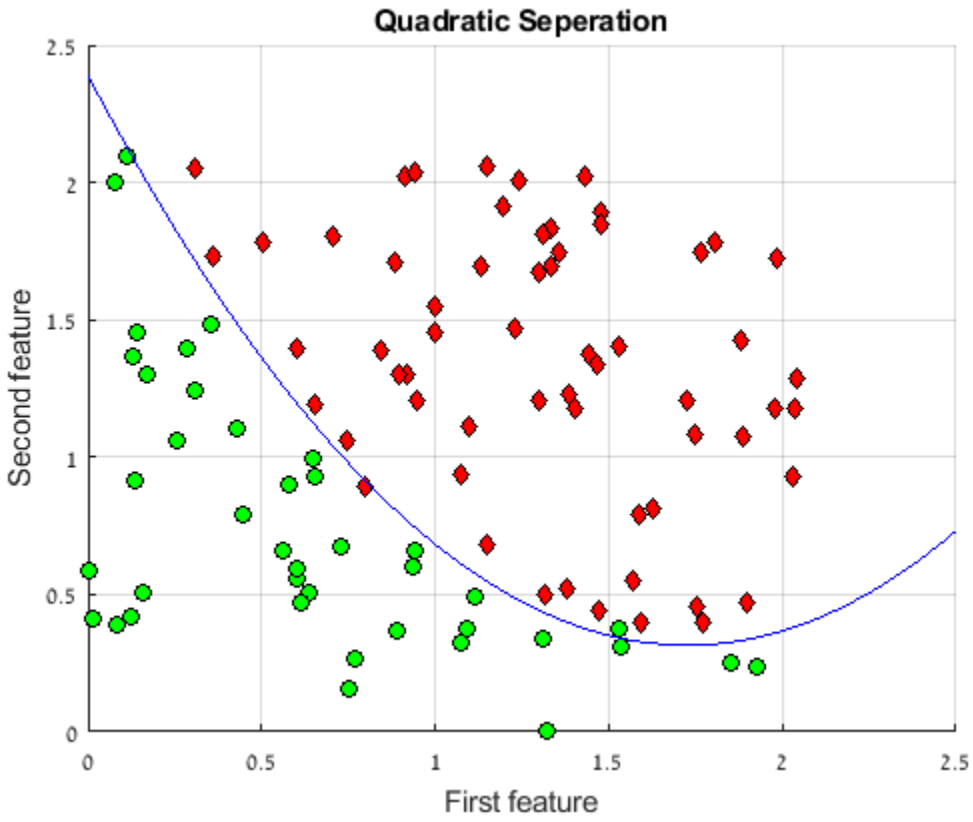
```
alpha = 0.1;
numOfIterations = 100000;
X2 = [ones(length(y),1) X X(:,1).^2]; %adding last column with the x1
 values
%in square by the formula on the exercise
theta2 = zeros(size(X2,2),1);

[theta2 , J]= gd(X2,y,theta2,alpha,numOfIterations);

figure(3);
grid;hold on
```

```
title('Quadratic Seperation');
plot(X(y==0,1),X(y==0,2),'ko','MarkerFaceColor', 'g'); hold on
plot(X(y==1,1),X(y==1,2),'kd','MarkerFaceColor', 'r');hold on
xlabel('First feature');ylabel('Second feature');hold on;

v = axis;
xmin = v(1);
xmax = v(2);
xx=linspace(xmin,xmax,numOfIterations);
yy=(-theta2(1)-theta2(2)*xx-theta2(4)*xx.^2)/theta2(3);% by the
 formula
line(xx,yy,'LineWidth', 1, 'Color', 'b')
```



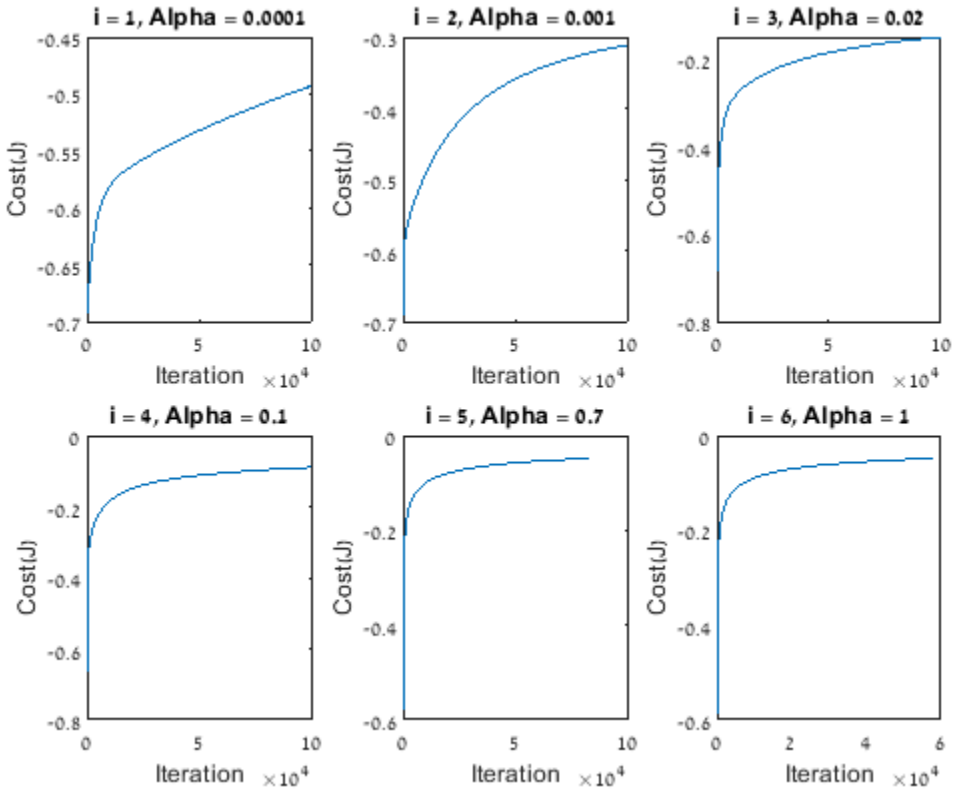
Section d

```
figure(4);
alpha1=[0.0001, 0.001, 0.02, 0.1, 0.7, 1];

for i=1:length(alpha1)
    theta3 = zeros(size(X2,2),1);
    [theta3, J] = gd(X2,y,theta3,alpha1(i),numOfIterations);
    subplot(2,3,i);
    plot(1:numOfIterations, J);
    title(sprintf('i = %g, Alpha = %g',i,alpha1(i)));
    xlabel('Iteration');ylabel('Cost(J)');
end
```

```
fprintf('We can see the raise of the cost(J) -  if the alpha is too
 small');
fprintf(' the raise is too slower,\nif the alpha is too high the');
fprintf(' raise of cost(J) is too higer,\nand if the alpha is in the
 middle');
fprintf(' of the two edges so the rais is moderate.\n');
```

```
We can see the raise of the cost(J) -  if the alpha is too small the
 raise is too slower,
if the alpha is too high the raise of cost(J) is too higer,
and if the alpha is in the middle of the two edges so the rais is
 moderate.
```



Section e

```
email_test = load('email_test_data.mat');%load the file(is a struct)

% Linear regression

fprintf('\nThe correct values classification using Linear regression:
 %i from %i\n',...
classification(email_test,theta2,0),length(email_test.ytest));


%Square regression
```

```
fprintf('The correct values classification using Square regression: %i
 from %i\n',...
classification(email_test,theta2,1),length(email_test.ytest));
```

```
The correct values classification using Linear regression: 21 from 25
The correct values classification using Square regression: 25 from 25
```

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